

B1.

4	7	4	7	3
2	5	5	3	6
7	4	3	1	3
5	6	2	4	3
4	4	5	3	3

Bảng tính toán:

rk	1	2	3	4	5	6	7
nh	1	2	7	6	4	2	3
cdg	1	3	10	16	20	22	25
sh	0	0	1	2	2	3	3

Kết quả cân bằng Histogram

2	3	2	3	1
0	2	2	1	3
3	2	1	0	1
2	3	0	2	1
2	2	2	1	1

$$S_1 = (1-1)/(25-1) \times (4-1) = 0$$

$$S_2 = (3-1)/(25-1) \times (4-1) \approx 0$$

$$S_3 = (10-1)/(25-1) \times (4-1) \approx 1$$

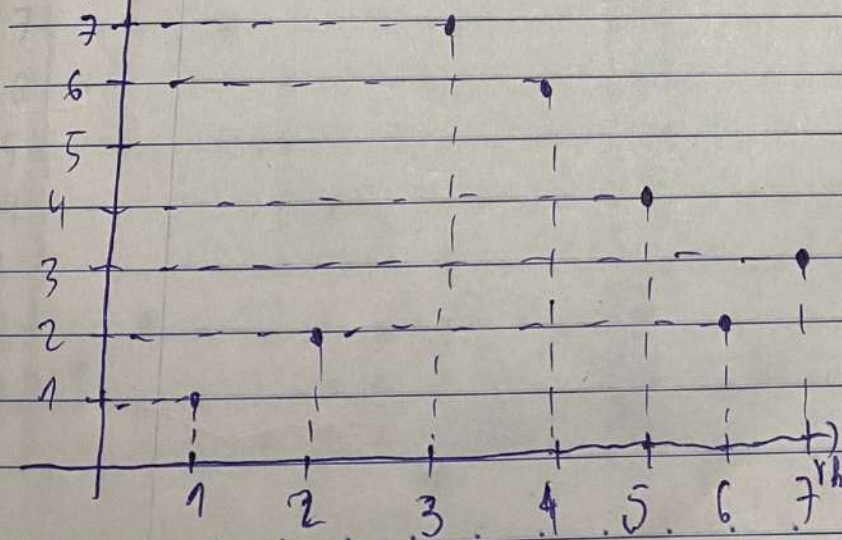
$$S_4 = (16-1)/(25-1) \times (4-1) \approx 2$$

$$S_5 = (20-1)/(25-1) \times (4-1) \approx 2$$

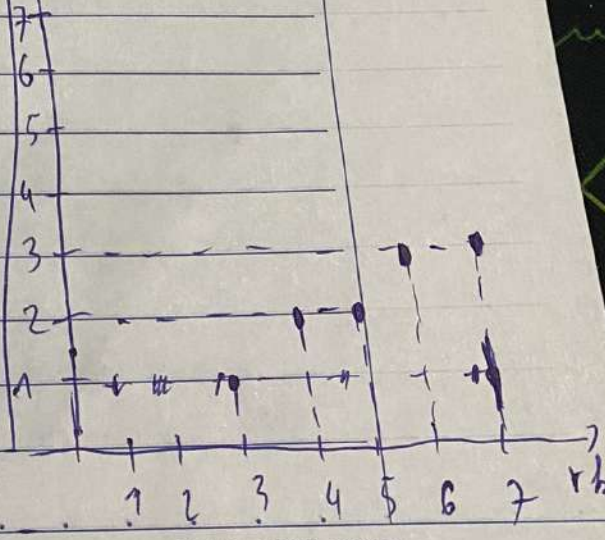
$$S_6 = (22-1)/(25-1) \times (4-1) \approx 3$$

$$S_7 = (25-1)/(25-1) \times (4-1) = 3$$

Trước nh



Sau sh



Bài 1:

4 7 4 7 3

2 5 5 3 6

7 4 3 1 3

5 6 2 4 3

4 4 5 3 3

rk	1	2	3	4	5	6	7
nh	1	2	7	6	4	2	3
cdy	1	3	10	16	20	22	25
sk	0	0	2	3	4	4	5

$$S_1 = (1-1) / (25-1) * 5 = 0$$

$$S_2 = (3-1) / (25-1) * 5 \approx 0$$

$$S_3 = (10-1) / (25-1) * 5 \approx 2$$

$$S_4 = (16-1) / (25-1) * 5 \approx 3$$

$$S_5 = (20-1) / (25-1) * 5 \approx 4$$

$$S_6 = (22-1) / (25-1) * 5 \approx 4$$

$$S_7 = (25-1) / (25-1) * 5 = 5$$

3 5 3 5 2

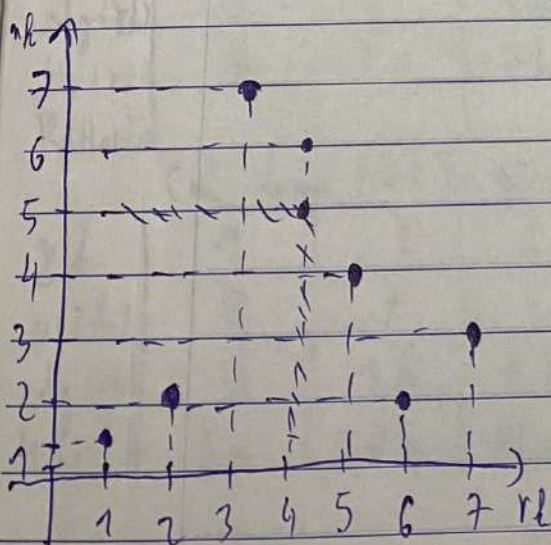
0 4 4 2 4

5 3 2 0 2

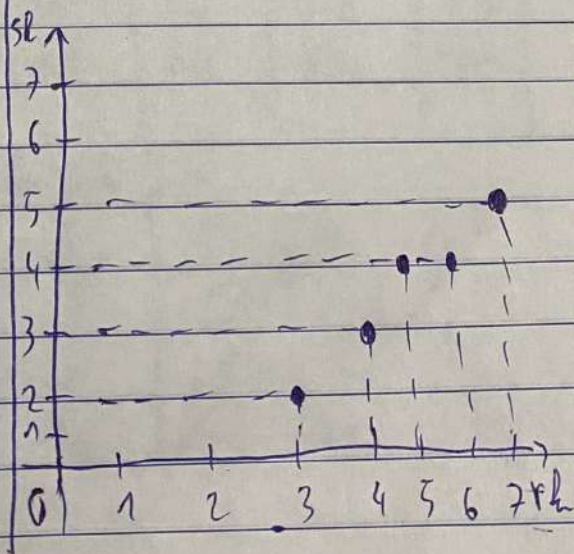
4 4 0 3 2

3 3 4 2 2

Trước



Sau



Câu 3:

$$I = \begin{pmatrix} 4 & 7 & 4 & 7 & 3 \\ 2 & 5 & 5 & 3 & 6 \\ 7 & 4 & 3 & 1 & 3 \\ 5 & 6 & 2 & 4 & 3 \\ 4 & 4 & 5 & 3 & 3 \end{pmatrix}$$

$$I_2 = \begin{pmatrix} 1 & 3 & 2 & 2 & 2 \\ 2 & 3 & 6 & 1 & 1 \\ 1 & 1 & 1 & 2 & 5 \\ 4 & 4 & 3 & 1 & 7 \\ 2 & 5 & 1 & 2 & 7 \end{pmatrix}$$

Thiết kế cho các mức sáng xám trong ảnh I_1 .

r_i	1	2	3	4	5	6	7
$p(r_i)$	1	2	7	6	4	2	3

Thiết kế cho các mức sáng xám trong ảnh I_2

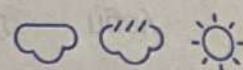
z_j	1	2	3	4	5	6	7
$p(z_j)$	8	7	3	2	2	1	2

- Cân bằng Histogram cho ảnh I_1 .

r_k	1	2	3	4	5	6	7
$p(r_k)$	1	2	7	6	4	2	3
$cdf(r_k)$	1	3	10	16	20	22	25
$H_1(r_k)$	7	21	70	112	140	154	175
$R(H_1(r_k))$							

Cân bằng Histogram cho ảnh I_2

z_k	1	2	3	4	5	6	7
$p(z_k)$	8	7	3	2	2	1	2
$cdf(z_k)$	8	15	18	20	22	23	25
$H_2(z_k)$	56	105	126	140	154	161	175

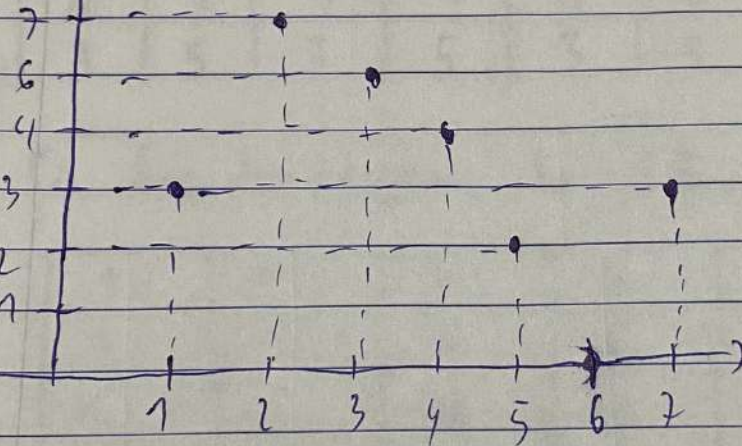


r_i	$H_1(r_i)$	z_j	$H_1(z_j)$	r_{new}
1	7	1	56	1
2	21	2	105	1
3	70	3	126	2
4	112	4	140	3
5	140	5	154	4
6	154	6	161	5
7	175	7	175	7

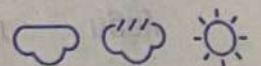
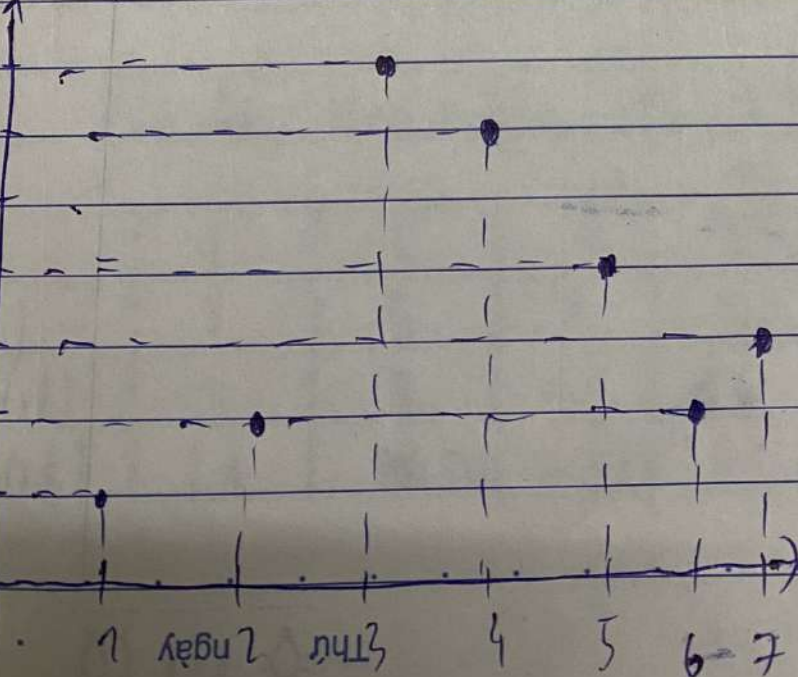
r	1	2	3	4	5	7
$p(r)$	3	7	6	4	2	3

Sau:

gần nhất



Trước:



Bài 4:

$$I_1 = \begin{pmatrix} 4 & 7 & 4 & 7 & 3 \\ 2 & 5 & 5 & 3 & 6 \\ 7 & 4 & 3 & 1 & 3 \\ 5 & 6 & 2 & 4 & 3 \\ 4 & 4 & 5 & 3 & 3 \end{pmatrix}$$

$$I_2 = I_1 = \begin{pmatrix} 1 & 3 & 2 & 2 & 2 \\ 2 & 3 & 6 & 1 & 4 \\ 1 & 1 & 1 & 2 & 5 \\ & & & & 4 \\ & & & & 2 \end{pmatrix} \begin{matrix} 14 & 5 & 2 \\ 4 & 7 & 5 & 3 \\ 2 & 6 & 4 & 7 \\ 1 & 1 & 2 & 6 \\ 7 & 5 & 6 & 3 \end{matrix}$$

cho các
thống kê mức xám

r_i	1	2	3	4	5	6	7
$p(r_i)$	1	2	7	6	4	2	3

Thống kê mức xám trang ảnh I_2 .

z_i	1	2	3	4	5	6	7
$p(z_i)$	3	5	3	5	3	3	3

Cân bằng Histogram cho ảnh I_1

r_h	1	2	3	4	5	6	7
$p(r_h)$	1	2	7	6	4	2	3
$cdg(r_h)$	1	3	10	16	20	22	25
$H_1(r_h)$	7	21	70	112	140	154	175

Cân bằng Histogram cho ảnh I_2

z_h	1	2	3	4	5	6	7
$p(z_h)$	3	5	3	5	3	3	3
$cdg(z_h)$	3	8	11	16	19	22	25
$H_2(z_h)$	21	56	77	112	133	154	175

Bài 5:

$$h = 0, h_1 = 0,9, h_2 = 0, h_3 = 3,5, c = 1,4$$

MT:

4	7	4
2	5	5
7	4	3

r	2	3	4	5	7
n	1	1	3	2	2
p	1/9	1/9	3/9	2/9	2/9

Cường độ ánh sáng trung bình:

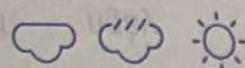
$$m = \frac{(2 \times 1 + 4 \times 3 + 5 \times 2 + 7 \times 2)}{9} = 41/9$$

Phương sai:

$$\begin{aligned} \sigma^2 &= \left(2 - \frac{41}{9}\right)^2 \times \frac{1}{9} + \left(3 - \frac{41}{9}\right)^2 \times \frac{3}{9} + \left(5 - \frac{41}{9}\right)^2 \times \frac{2}{9} \\ &+ \left(7 - \frac{41}{9}\right)^2 \times \frac{2}{9} \\ &= \frac{200}{81} = 2,469 \end{aligned}$$

$$\begin{aligned} \text{Xét điều kiện} \quad & \left\{ \begin{aligned} 0 \times \frac{41}{9} &\leq \frac{41}{9} \leq 0,9 \times \frac{41}{9} \quad (K^0 \text{ / m}) \\ 0 \times \frac{200}{81} &\leq \frac{200}{81} \leq 3,5 \times \frac{200}{81} \end{aligned} \right. \end{aligned}$$

$$\Rightarrow \text{không TM} \Rightarrow \gamma = 5$$



~~Phân bố~~ sai

$$s_1) (x, y) = (0, 0)$$

$$0 \quad 0 \quad 0$$

$$0 \quad 4 \quad 7$$

$$0 \quad 2 \quad 5$$

r	0	2	4	5	7
n	5	1	1	1	1
p	5/9	1/9	1/9	1/9	1/9

$$m = \frac{(0 \times 5) + 2 \times 1 + 4 \times 1 + 5 \times 1 + 7 \times 1}{9} = 2$$

$$d^2 = (0-2)^2 \times \frac{5}{9} + (2-2)^2 \times \frac{1}{9} + (4-2)^2 \times \frac{1}{9} + (5-2)^2 \times \frac{1}{9} + (7-2)^2 \times \frac{1}{9} = \frac{58}{9}$$

$$\Rightarrow \frac{58}{9} \text{ Xét điều kiện } \left\{ \begin{array}{l} 0 \times \frac{41}{9} \leq 2 \leq 0,9 \times \frac{41}{9} \Rightarrow \text{TIVI} \\ 0 \times \frac{200}{81} \leq \frac{58}{9} \leq 3,5 \times \frac{200}{81} \end{array} \right.$$

$$\Rightarrow *M \Rightarrow y = \text{round}(1,4 \times 4) = 6$$

$$\Rightarrow y = 6$$

$$2) (x, y) = (0, 1)$$

	0	0	0
	4	7	4
	2	5	5

r	0	2	4	5	7
n	3	1	2	2	1
p	3/9	1/9	2/9	2/9	1/9

$$m = (0 \cdot 3 + 2 \cdot 1 + 4 \cdot 2 + 5 \cdot 2 + 7 \cdot 1) = 2$$

$$\sigma^2 = (0-2)^2 \times \frac{3}{9} + (2-2)^2 \times \frac{1}{9} + (4-2)^2 \times \frac{2}{9} + (5-2)^2 \times \frac{2}{9} + (7-2)^2 \times \frac{1}{9} = \frac{59}{9}$$

$$\text{Xét DK: } \begin{cases} 0 \times \frac{1}{9} \leq 2 \leq 0,9 \times \frac{1}{9} \\ 0 \times \frac{200}{81} \leq \quad \leq 3,5 \times \frac{200}{81} \end{cases}$$

$$\text{TM} \Rightarrow \gamma = \text{round}(1,4 \cdot 7) = 7$$

$$\Rightarrow \gamma = 7$$

$$Z(x, y) = (0, 2)$$

$$0 \quad 0 \quad 0$$

$$7 \quad 4 \quad 0$$

$$5 \quad 5 \quad 0$$

r	0	4	5	7
n	5	1	2	1
p	5/9	1/9	2/9	1/9

$$m = \frac{(0 \times 5 + 4 \times 1 + 5 \times 2 + 7 \times 1)}{9} = \frac{7}{3}$$

$$\sigma^2 = \left(0 - \frac{7}{3}\right)^2 \times \frac{5}{9} + \left(4 - \frac{7}{3}\right)^2 \times \frac{1}{9} + \left(5 - \frac{7}{3}\right)^2 \times \frac{2}{9} + \left(7 - \frac{7}{3}\right)^2 \times \frac{1}{9} = \frac{650}{81}$$

$$+ \left(7 - \frac{7}{3}\right)^2 \times \frac{1}{9} = \frac{650}{81}$$

$$\text{Xét điều kiện: } \begin{cases} 0 \times 4/9 \leq 7/3 \leq 0,9 \times 4/9 \\ 0 \times 200/81 \leq \frac{650}{81} \leq 200/81 \times 3,5 \end{cases}$$

$$\Rightarrow JM : \gamma = \text{round}(1,4 \times 4) = 6$$

$$\gamma = 6$$

$$4 \ (x, y) = (1, 0)$$

0	4	7
0	2	5
0	7	4

r	0	2	4	5	7
n	3	1	2	1	2
p	3/9	1/9	2/9	1/9	2/9

$$m = \frac{(0 \times 3 + 2 \times 1 + 4 \times 2 + 5 \times 1 + 7 \times 2)}{9} = \frac{29}{9}$$

$$s'^2 = (0 - 29/9)^2 \times \frac{3}{9} + (2 - 29/9)^2 \times \frac{1}{9} + (4 - 29/9)^2 \times \frac{2}{9}$$

$$+ (5 - 29/9)^2 \times \frac{1}{9} + (7 - 29/9)^2 \times \frac{2}{9} = \frac{4154}{729}$$

$$= \text{Xét đh} \left\{ \begin{array}{l} 0 \times 41/9 \leq 29/9 \leq 0,9 \times 41/9 \\ 0 \times 200/81 \leq \frac{4154}{729} \leq 3,5 \times \frac{200}{81} \end{array} \right.$$

$$\Rightarrow TM : \gamma = \text{round}(1,4 \times 2) = 3$$

$$\gamma = 3$$

$$5 (x, y) = (1, 2)$$

7	4	0
5	5	0
4	3	0

r	0	3	4	5	7
n	3	1	2	2	1
p	3/9	1/9	2/9	2/9	1/9

$$m = \frac{(0 \times 3 + 3 \times 1 + 4 \times 2 + 5 \times 2 + 7 \times 1)}{9} = \frac{19}{9}$$

$$\sigma^2 = \left(0 - \frac{19}{9}\right)^2 \times \frac{3}{9} + \left(3 - \frac{19}{9}\right)^2 \times \frac{1}{9} + \left(4 - \frac{19}{9}\right)^2 \times \frac{2}{9} + \left(5 - \frac{19}{9}\right)^2 \times \frac{2}{9} + \left(7 - \frac{19}{9}\right)^2 \times \frac{1}{9} = \frac{557}{81}$$

$$\text{Xét điều kiện} \left\{ \begin{array}{l} 0 \times 41/9 \leq 19/9 < 0,9 \times 41/9 \\ 0 \times 200/81 \leq \frac{557}{81} < 3,5 \times \frac{200}{81} \end{array} \right.$$

$$\Rightarrow TM : y = \text{round}(1,4 \times 5) = 7$$

$$\Rightarrow y = 7$$

$$G(x, y) = (2, 0)$$

0	2	5
0	7	4
0	0	0

r	0	2	4	5	7
n	5	1	1	1	1
p	5/9	1/9	1/9	1/9	1/9

$$m = \frac{10 \cdot 5 + 2 \cdot 1 + 4 \cdot 1 + 5 \cdot 1 + 7 \cdot 1}{9} = 2$$

$$\sigma^2 = \frac{(0-2)^2 \cdot \frac{5}{9} + (2-2)^2 \cdot \frac{1}{9} + (4-2)^2 \cdot \frac{1}{9} + (5-2)^2 \cdot \frac{1}{9} + (7-2)^2 \cdot \frac{1}{9}}{9}$$

$$= \frac{58}{9}$$

$$\text{Xét DK: } \begin{cases} 0 \times 41/9 \leq 2 \leq 0,9 \times 41/9 \\ 0 \times 200/81 \leq \frac{58}{9} \leq 3,5 \times 200/81 \end{cases}$$

$$\Rightarrow \text{TVM} \Rightarrow y = \text{round}(1,4 \times 7) \Rightarrow y = 7$$

$$7) (x, y) = (2, 1)$$

$$\begin{array}{ccc} 2 & 5 & 5 \\ 7 & 4 & 3 \\ 0 & 0 & 0 \end{array}$$

r	0	2	3	4	5	7
n	3	1	1	1	2	1
p	3/9	1/9	1/9	1/9	2/9	1/9

$$m = \frac{(0 \times 3 + 2 \times 1 + 4 \times 1 + 3 \times 1 + 5 \times 2 + 7 \times 1)}{9} = \frac{26}{9}$$

$$\sigma^2 = \left(0 - \frac{26}{9}\right)^2 \times \frac{3}{9} + \left(2 - \frac{26}{9}\right)^2 \times \frac{1}{9} + \left(3 - \frac{26}{9}\right)^2 \times \frac{1}{9}$$

$$+ \left(4 - \frac{26}{9}\right)^2 \times \frac{1}{9} + \left(5 - \frac{26}{9}\right)^2 \times \frac{2}{9} + \left(7 - \frac{26}{9}\right)^2 \times \frac{1}{9} = \frac{476}{81}$$

$$\text{Xét điều kiện: } \begin{cases} 0 \times 4 \frac{1}{9} \leq \frac{26}{9} \leq 0,9 \times 4 \frac{1}{9} \end{cases}$$

$$0 \times 4 \frac{1}{9} \leq \frac{476}{81} \leq 3,5 \times \frac{4 \frac{1}{9}}{1}$$

$$\rightarrow \text{TM: } \gamma = \text{round}(1,4 \times 4) = 6$$

$$\gamma = 6$$

$$g(x, y) = (2, 2)$$

$$5 \quad 5 \quad 0$$

$$4 \quad 3 \quad 0$$

$$0 \quad 0 \quad 0$$

r	0	3	3	4	5
n	5	1	1	1	2
p	5/9	1/9	1/9	1/9	2/9

$$m = \frac{(0 \times 5 + 3 \times 1 + 4 \times 1 + 5 \times 2)}{9} = \frac{17}{9}$$

$$\sigma^2 = \left(0 - \frac{17}{9}\right)^2 \times \frac{5}{9} + \left(3 - \frac{17}{9}\right)^2 \times \frac{1}{9} + \left(4 - \frac{17}{9}\right)^2 \times \frac{1}{9} + \left(5 - \frac{17}{9}\right)^2 \times \frac{2}{9} = \frac{386}{81}$$

$$+ \left(5 - \frac{17}{9}\right)^2 \times \frac{2}{9} = \frac{386}{81}$$

$$\text{Xét điều kiện} \quad \left\{ \begin{array}{l} 0 \times 41/9 \leq 17/9 \leq 41/9 \times 0,9 \\ 0 \times 200/81 \leq \frac{386}{81} \leq 3,5 \times \frac{200}{81} \end{array} \right.$$

$$\Rightarrow TM : q = \text{round}(1,4 \times 3) = 4$$

\Rightarrow Ma trận mới

6	7	6
3	5	7
7	6	4